Doe Productivity of Boerawa Goat on Rural Condition

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Abstract. This research was carried out at Gisting sub-District, Tanggamus Regency, in order to find out doe productivity of Boerawa goat on rural on condition. This research involved 120 doe Boerawa goat housed in elevated barns. Measurements were performed to evaluate the litter size, birth weight, weight at weaning, and pre-weaning mortality. The results of the present research showed that birth weight of the kids was 3.10 kg and 2.94 kg for male and female, respectively. The average birth weight was based on the type of birth 3.20 kg and 3.04 kg for the single versus twin born kids. It was documented that the average weight at weaning of the kids were 17.12 kg and 16.23 kg for male and female, respectively. Whereas based on birth type, the average weight was of the single born kids and the twin at weaning were 17.30 versus 16.63 kg. In addition, doe reproduction index was 2.36 weaned kids/year, and the average doe productivity was 41.52 kg.

Keywords: Boerawa goat, doe productivity, rural condition.

Abstrak. Penelitian ini dilakukan di Kecamatan Gisting Kabupaten Tanggamus, dalam rangka untuk mengetahui produktivitas induk kambing Boerawa pada kondisi pedesaan. Penelitian ini melibatkan 120 induk kambing Boerawa yang dipelihara di kandang panggung. Pengukuran dilakukan untuk mengevaluasi ukuran jumlah cempe sekelahiran, bobot lahir, bobot sapih, dan kematian pra-sapih. Hasil dari penelitian ini menunjukkan bahwa bobot lahir cempe adalah 3,10 kg dan 2,94 kg (masing-masing untuk jantan dan betina). Bobot lahir rata-rata didasarkan pada tipe kelahiran tunggal dan kembar adalah masing-masing 3.20 kg dan 3,04 kg. Diperoleh hasil bahwa bobot sapih adalah 17,12 kg dan 16,23 kg (masing-masing untuk jantan dan betina). Sedangkan berdasarkan tipe kelahiran, bobot sapih rata-rata dari tipe kelahiran tunggal dan kembar adalah 17.30 dan 16.63 kg. Selain itu, indeks reproduksi induk sebesar 2,36 cempe sapihan/tahun, dan produktivitas induk rata-rata adalah 41,52 kg.

Kata kunci: Kambing Boerawa, produktivitas induk , kondisi pedesaan.

Introduction

Small ruminants are ubiquitous, and contribute significantly to the subsistence, economic and social livelihoods of a large human population in low-input, smallholder production systems in developing countries. These animals have lower feed and capital requirements than larger species, making them suited to smallholder producers (Devendra, 2002). They also have shorter generation intervals, higher prolificacy, small size, and are better able to utilize a wide range of feedstuffs, including crop residues that are of little value otherwise (Holst, 1999; Pelant et al., 1999). In all developing countries, goats have made a magnificent contribution to the rural economy as a whole (Lebbie and Ramsay, 1999; Devendra, 2001; Morand-Fehr et al., 2004), are economically viable (Bosman et al., 1997), play a significant role in the poor rural households (Nimbkar et al., 2000; Lebbie, 2004) and contribute a substantial amount to the farmer's total income. Generally speaking, goats are defined as multifunctional animals (Mahanjana and Cronj´e, 2000; Iniguez, 2004).

The majority of goat species in Indonesia is Kacang goat and Peranakan Etawa (Edey,

1983). Peranakan Etawa (PE) goat is crossbreeding goat between Kacang and Etawa goats (Jamnapari). To improve goat productivity to fulfill meat demand and to improve public welfare, it is necessary to crossbreed local goat with better productivity goat.

Crossbreeding is one of efforts to improve local goat productivity by breeding local goat and other goat that have superior characteristics (Syawal, 2010; Barillet, 2007; Shrestha and Fahmy, 2007a,b). Boerawa goat is a crossbred of female PE goat and male Boer goat developed in Tanggamus regency. The success of this goat crossbreeding development made Lampung Governor in Agriculture Expo in July 2007 pronounce Boerawa goat as superior goat and Gisting sub district in Tanggamus regency would be the area for its development.

Goat in Indonesia can reproduce along the year and it has prolific characteristic (ability to help more than one offspring), so that this helps improve goat population (Sutama, 2009). Goat is able to adapt to areas with less qualified vegetation, and is also a potential component of public meat provider (Subandriyo et al., 1995).

Development of goat farming in Lampung province in last five years showed increasing trend; the goat population was 995,901 in 2007; 1,012,605 in 2008; 1,015,700 in 2009; 1,05,330 in 2010; and 1,081,150 in 2011 (Annual Report of Farming and Animal Health Office in 2011). The rate of goat population increase in Lampung province from 2007 to 2011 reached 2.6% annually. However, this rate can be more improved considering that most goat farmers are small size public farming businesses that use traditional farming technology and simple management. Therefore, he objective of this research was to find out doe productivity of Boerawa goat under rural conditions.

Materials and Methods

This research was conducted in Gisting sub district of Tanggamus regency as the area of Boerawa goat development in Lampung province located in highland agro-ecosystem. Survey method was applied involving members of *Village Breeding Center* Boerawa goat farmer group. It was conducted in 2010-2011 and divided into two stages. The first stage started from January 2010 to December 2010, and the second stage started from January 2011 to December 2011. In every stage, observations were conducted to 60 Boerawa goat does from early pregnancy, giving birth, until goat kid weaning age.

Boerawa Goat maintenance was conducted intensively, does were located in onstage cage and fed with vegetation. Feeding was given ad-libitum two times daily.

Observed variables included amount of born goats, birth weight, average of daily gain (ADG), litter size, and weaning weight. Data of doe productivity was analyzed using a method based on formula from Amir and Knipscheer (1989).

Result and Discussion

Litter size. Litter size is the number of offspring produced at one birth by a doe. The common goat litter size is 2 goat kids despite a little percentage of doe with 3 or 4 goat kids litter size. Goat prolific characteristic is influenced by species, genetic factors, as well as doe's age when it reproduces (Sutama, 2009). This research results showed that goat farming up keeping was properly conducted by farmers in Gisting. The number of goat kids born was 206 with litter size of 1.8 and mortality in pre-weaning was 6.5% (Table 1).

Table 1. Birth, litter size, and mortality in pre-weaning of Boerawa goat kids

Description	Stage 1	Stage 2	Average
Number of doe (head)	60	60	60
Number of goat kids (head)	107	109	108
Litter size (kid)	1.78	1.82	1.80
Mortality of pre-weaning (%)	7.47	4.58	6.50

The average litter size in this research was 1.8. Average value of litter size of crossbreed goat was higher than value of PE goat (1.56) (Sodiq et al., 2002), and it belonged to average range of Boerawa litter size value that was close to 2.00 (Lu, 2002). Both genetic and environmental factors have been reported to affect birth weight and litter size (Adebambo et al., 1994; Horque et al., 2002).

Kid production has received considerable attention in most parts of the world. However, little has been done on the productivity and the factors that affect productivity of tropical goat breeds. Such information is important if they are to be incorporated into goat production systems (Almeida et al., 2006; Phengvichith and Ledin, 2007). In traditional small ruminant systems, breeding objectives invariably include both tangible and intangible traits. For instance, live weight, litter size and lambing frequency are important production traits (Holst, 1999; Kosgey et al., 2006; Ayalew et al., 2003; Baker et al., 2004; Gicheha et al., 2006).

Pre-weaning mortality. The survival ability of pre weaning goat is an important parameter in productivity development. Mortality of pre-weaning goat is closely related to numbers of goats. In the first stage, number of born goats was lower than that of stage 2. Mortality rate of pre-weaning kid goat in this research was averagely 6.5%, which was higher than 4.86% in Utomo et al. (2005).

Mahmilia (2007) reported that pre-weaning mortality of crossbreeding between Boerawa and Kacang goats reached 20.97%, while pre-weaning mortality in twin birth reached 42.85%. Most pre-weaning goat mortality in this research were caused by farmer's negligence in caring newborn goat kids. Many mortalities happened in twin birth due to less milk production, leading to the lack of milk consumption that causes goat kids death. Farmers should feed them with additional milk and should not let them depend on their mother's milk.

One major cause of low productivity in small ruminants is high lamb and kid mortality. Among the factors identified as contributing to early postnatal lamb and kid mortality are birth type (whether single, twins or triplets), season, age, sex, management, birth weight, nutritional status of the dam, and various forms of maternal and neonatal behaviour (Addae et al., 2000).

Birth weight. The average birth weight of Boerawa goat for single and twin births was 3.20 kg/goat and 3.04/goat, respectively (Table 2). Compared to result reported by Mahmilia *et al* (2007) that average birth weight of Boerawa and Kacang crossbreeding goat was 2.08 kg/ goat for single birth and 1.80 kg/goat for twin birth, the same results in this research were higher. Therefore, Boerawa goat had good potential to continually develop.

The difference of birth weight in single and twin birth is caused by the increasing numbers of kid goats in each doe; the single fetus could absorb nutrition fully from its parent during embryo growth in uterine, while twin fetus would compete in absorbing nutrition (Atkins and Gilmour, 1981).

Based on sex, male average birth weight was higher (3.10 kg/goat) than female (2.94 kg/goat). The same pattern was reported by Utomo et al. (2005) that male birth weight was higher (2.73 kg/goat) than female (2.47 kg/goat). Similar finding was also reported by Mahmilia et al. (2007) that male birth weight of Boerawa and Kacang crossbreeding goat was higher (2.10 kg/goat) than female (1.91 kg/goat). In conclusion, male birth weights of local and crossbreeding goats are higher than female birth weights. The males were always heavier and grew faster than the females. Sex differences increase with growth rate indicating that male kids are more responsive to improvements in the environment, which is also predicted by Hermiz et al. (1997) in Angora goats.

Table 2. Birth weight, weaning weight, and average daily gain of Boerawa goat

Description	Stage 1			Stage 2			Average		
	Birth weight (kg)	Weaning weight (kg)	ADG (kg/day)	Birth weight (kg)	Weaning weight (kg)	ADG (kg/day)	Birth weight (kg)	Weaning weight (kg)	ADG (kg/day)
Birthtype									
Single$^{(ns)}$	3.14±0.14	17.32±0.70	0.158±0.01	3.25±0.21	17.27±0.58	0.156±0.05	3.20±0.18	17.30±0.64	0.157±0.03
Twin$^{(ns)}$	3.01±0.09	16.52±0.25	0.150±0.02	3.07±0.13	16.74±0.44	0.152±0.04	3.04±0.11	16.63±0.35	0.151±0.03
Sex									
Male$^{(ns)}$	3.06±0.07	16.86±0.44	0.153±0.04	3.14±0.13	17.38±0.28	0.158±0.08	3.10±0.10	17.12±0.36	0.156±0.06
Female$^{(ns)}$	2.87±0.09	16.04±0.40	0.146±0.08	3.01±0.09	16.42±0.28	0.149±0.04	2.94±0.09	16.23±0.34	0.148±0.07

(ns) =non significant

The variation in the birth weight reflected the level of the management as well as some environmental effects on the does during pregnancy. The level of management is bound to vary according to the ability of the farm manager, his efficiency to supervise the staff, availability of financial recourses and culling strategies. Availability of feed could not be the same over the years which could have affected the productivity of the animals (Yaqoob et al., 2009).

The single born kids had better opportunities in the mother's womb than the twins or triplets and hencethey were heavy at birth (share of milk in twin and triplet than single born). Single born kids being heavier than twin or multiple born kids was also reported by (Nahardeka et al., 2000; Singh 2002; Ganeshkumar et al., 2005; Wenzhong et al., 2005; Zahraddeen et al., 2007).

Weaning weight. Weaning weight or weight at 90 days old in common can be used as a goat selection criterion. Higher weaning weight is expected to produce higher rate of living weight increase in post weaning. The average weaning weight for single birth is 17.30 kg/goat, and twin birth is 16.63 kg/goat. The average weaning weight based on sex is 17.12 kg/goat for male and 16.23 kg/goat for female.

Weaning weight in this research is higher than that in Utomo et al. (2005) where weaning weights for Java Randu goat are 10.82 kg for single birth and 9.09 kg for twin birth, and 10.74 kg for male and 9.17 kg for female. The high differences of weaning weight may be caused by genetic factors where Boerawa goat is a crossbred of female PE and male Boer goat, and influenced by environment factors; especially management and feed. Garza and Garza (1997) noted that at weaning Boer crossbred kids were 15±20%

heavier than pure-bred kids of the dam breed. Lewis et al. (1997) reported greater body weight and body weight gain for Boer crosses than those of Spanish goats, although feed efficiency was similar.

The type of birth had significant effect on body weight. The single born kids were significantly heavier compared to twin and triplet kids. The twins and triplets were weaned at similar weights. Single born kids were heavier than twins and triplets at the age of 6, 9 and 12 months. The higher weights of single born kids were probably due to the initial higher weight gain by these kids (Yaqoob et al., 2009). Singh et al. (2000) reported that single born kids were significantly heavier than twin born kids at 3 and 6 months of age.

The pre-weaning average daily gain of single born kids was significantly higher than twin and triplet born kids. Evidently, single born kids had not to share mother's milk with any other kid, thus they got their due share of milk during early stage of life. Hence growth rate of single born kids was better than that of twins or triplets (Yaqoob et al., 2009; Zhang et al., 2006).

Kuchtík and Sedláčková (2005) reported that difference between daily gains of single kids and twins was significant. Portolano et al. (2002) found significantly higher daily gain in single born kids than in twins during the period from birth to day 45, but in the case of twins they noticed slightly higher growth intensity during day 15–day 30 and day 30–day 45.

The birth weight and early growth rate of animals are determined not only by genetic potential but also by maternal and environmental factors (Mandal et al., 2006; Zhang et al., 2009; Al-Shorepy et al., 2002; Mugambi et al., 2007). Body weights and growth rates in pre-weaning are often considered as an early indicator of the late growth and economic benefit (Portolano et al., 2002; Hanford et al., 2006; Mandal et al., 2008).

Doe productivity evaluation. Doe productivity evaluation is conducted based on doe productivity index (DPI) value (Amir and Knipscheer, 1989). DPI indicates productivity of a doe in producing kid goats annually. DPI = DRI x weaning weight average. DRI is doe reproduction index that is estimated with the following formula: DRI = LS (1-M)/BI, where LS = litter size; M= Mortality (%); BI= Birth Interval (annually).

The average of Boerawa goat birth interval in this research is 8 months, based on the formula above, the estimation derived value of DRI was 2.49 goats/doe/year. The value of DPI than estimated by using this formula: DPI = DRI x weaning weight average resulting in DPI is 41.52 kg/doe/year.

The DPI and DRI estimation result in this research is higher than that by Utomo et al. (2005) suggesting DPI 2.36 goats/doe/year and DRI 23.51 kg/doe/year. The result of this research belongs to the range of result reported by Dakhlan et al. (2011) suggesting Boerawa goat DPI with rational feed is 60.98 kg/doe/year, and Boerawa goat DPI with traditional feed is 33.16 kg/doe/year. The aforementioned conditions indicate that Boerawa goat still has potential to develop, and with proper feed management DPI value is still able to improve.

The role of doe as productivity determinant in goat business is relatively high, where DRI estimation can predict the productivity. Goat farming productivity improvement is very dependable on reproduction ability. Meanwhile, reproduction is influenced by optimum feeding, environment, and management (Sutama, 2009).

In small ruminants the profitability of suckling systems of production depends

primarily on the efficiency of offspring production and the most important factor affecting flock efficiency is reproduction. Increasing reproduction is the most important ways of improving meat production in the tropics (Devendra and McLeroy, 1982; Chemineau et al., 1983, 1991). The output (number) of the breeding population is also dependent upon a reduced mortality rate. This trait is related to disease impacts, nutritional deficiencies and inadequate management. Moreover, the flock meat output is dependent also upon the weight of progeny produced. Weight gain is therefore another important parameter. Many authors argued that growth and development of animals are the basis for meat production (van Niekerk and Casey, 1988; Dzazuma et al., 2000; Erasmus, 2000; Dhanda et al., 2003). Increasing reproductive performances, reducing mortality rate, accelerating growth rate and improving carcass merit are multiple and interdependent objectives. Finally, overall productivity of goats depends on numerous components: genotype, environment and husbandry factors (Alexandre and Mandonet, 2005).

Conclusion

The conclusion of the research is that productivity of Boerawa doe goat up kept in rural conditions currently has DPI value of 41.52 kg/doe/year. It shows that Boerawa goats have a great potential to be developed to meet public needs.

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